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FUJITSU MICROELECTRONICS
SUPPORT SYSTEM

SS01-71113-1E

DSU-FR EMULATOR

BGA-420P ADAPTER TYPE 3

MB2198-150-E

OPERATION MANUAL

FUJITSU

PREFACE

Thank you for purchasing the DSU-FR*1 emulator BGA-420P adapter type 3 (MB2198-150-E).
The MB2198-150-E is a development support tool for developing and evaluating application products based on the FR family of microcontrollers manufactured by FUJITSU MICROELECTRONICS.
This document is for engineers developing FUJITSU MICROELECTRONICS FR family microcontroller application products using the DSU-FR emulator BGA-420P adapter type 3*2, and describes the functionality and handling of the adapter and the configuration methods. Read this manual thoroughly before using the adapter.

*1 : FR, the abbreviation of FUJITSU RISC controller, is a line of products of FUJITSU MICROELECTRONICS LIMITED.
*2 : Referred to as the "adapter".

■ Using the product safely

This manual contains important information for using this product safely. Be sure to read this manual before using the product, and to follow the directions given in this manual in order to use the product correctly.
In particular, thoroughly read the "■ Caution of the product described in this manual" at the start of this document, and perform a thorough safety check before using the product.
Store this manual in a safe location where it can easily be accessed at any time while you are using the product.

■ Warranty and liability disclaimers

The specifications of the product are subject to change without notice.
FUJITSU MICROELECTRONICS assumes no liability for any loss or damage whatsoever directly or indirectly arising out of the use of the product.

■ Product operating environment

Use the product at an operating temperature of between +5 °C and +35 °C and at an operating humidity of between 20% to 80%. Avoid using it in a hot or humid environment and prevent condensation.
The product is a frameless PC board unit with all electronic components exposed. Therefore, do not put anything on the product, do not touch or let an electrically charged material contact a metal part of it. Once the product has been powered, try to keep those objects away from it which may short-circuit it or easily catch fire and burn. Use the product as horizontal as possible and avoid operating it at a place exposed to strong vibration, dust, or explosive gas.
Note that using the product not in the above operating environment may unexpectedly cause personal injury to the user (or another person if present near the product) or physical damage to properties around the product.
You should also keep the packaging materials used for shipping the product. They work well as they are when you transport the product again, for example, if it becomes out of order and needs to be repaired.

■ Related Manuals

You should refer to the following manuals as well:

- Evaluation MCU hardware manual or datasheet
- Header operation manual
- "DSU-FR EMULATOR MB2198-01-E OPERATION MANUAL"
- "SOFTUNE Workbench OPERATION MANUAL"
- "SOFTUNE Workbench USER'S MANUAL"

■ European RoHS compliance

Products with a -E suffix on the part number are European RoHS compliant products.

■ Notice on this document

All information included in this document is current as of the date it is issued. Such information is subject to change without any prior notice.
Please confirm the latest relevant information with the sales representatives.

■ **Caution of the product described in this manual**

The following precautions apply to the product described in this manual.

⚠ WARNING	Indicates a potentially hazardous situation which could result in death or serious injury and/or a fault in the user's system if the product is not used correctly.

Electric shock, Damage	Before performing any operation described in this manual, turn off all the power supplies to the system. Performing such an operation with the power on may cause an electric shock or device fault.
Electric shock, Damage	Once the product has been turned on, do not touch any metal part of it. Doing so may cause an electric shock or device fault.

⚠ CAUTION	Indicates the presence of a hazard that may cause a minor or moderate injury, damages to this product or devices connected to it, or may cause to loose software resources and other properties such as data, if the device is not used appropriately.

Cuts, Damage	Before moving the product, be sure to turn off all the power supplies and unplug the cables. Watch your step when carrying the product. Do not use the product in an unstable location such as a place exposed to strong vibration or a sloping surface. Doing so may cause the product to fall, resulting in an injury or fault.
Cuts	The product contains sharp edges that are left unavoidably exposed, such as jumper plugs. Handle the product with due care not to get injured with such pointed parts.
Damage	Do not place anything on the product or expose the product to physical shocks. Do not carry the product after the power has been turned on. Doing so may cause a malfunction due to overloading or shock.
Damage	Since the product contains many electronic components, keep it away from direct sunlight, high temperature, and high humidity to prevent condensation. Do not use or store the product where it is exposed to much dust or a strong magnetic or electric field for an extended period of time. Inappropriate operating or storage environments may cause a fault.
Damage	Use the product within the ranges given in the specifications. Operation over the specified ranges may cause a fault.
Damage	To prevent electrostatic breakdown, do not let your finger or other object come into contact with the metal parts of any of the connectors. Before handling the product, touch a metal object (such as a door knob) to discharge any static electricity from your body.
Damage	When turning the power on or off, follow the relevant procedure as described in this document. Before turning the power on, in particular, be sure to finish making all the required connections. Furthermore, be sure to configure and use the product by following the instructions given in this document. Using the product incorrectly or inappropriately may cause a fault.
Damage	Always turn the power off before connecting or disconnecting any cables from the product. When unplugging a cable, unplug the cable by holding the connector part without pulling on the cable itself. Pulling the cable itself or bending it may expose or disconnect the cable core, resulting in a fault.
Damage	Because the structure of the MCU socket does not allow an evaluation MCU to be mounted in the incorrect orientation, be very careful of the orientation of the evaluation MCU when mounting it. Inserting the evaluation MCU in the wrong orientation may damage the MCU, causing the MCU to become faulty.
Damage	Because the product has no casing, it is recommended that it be stored in the original packaging. Transporting the product may cause a damage or fault. Therefore, keep the packaging materials and use them when re-shipping the product.

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1. OVERVIEW

■ Overview

This product is a development assistance tool for developing and evaluating hardware and software. This product is used in combination with a DSU-FR emulator LQFP-144P header*1 to connect the DSU-FR emulator (MB2198-01-E)*2 to a user system that uses a FUJITSU MICROELECTRONICS FR family microcontroller.

*1 : Referred to as the “header”.

*2 : Referred to as the “emulator”.

The main features of this product are as follows.

- The adapter consists of an adapter board and flat cables (2 sets of the standard and long types).
- The adapter board has an on-board IC socket for an evaluation MCU (420-pin BGA package code: BGA-420P-M01).
- Connected to the header using flat cables (standard or long).
- Used in combination with the header to connect the emulator and the user system.
- Power to the adapter is supplied from the emulator, or supplied from the user system via the header.
- Supports the internal ROM emulation memory function.
- Supports the external trace function.
- Supports the power-on debug function.

■ Checking the items packaged

Check that the package contains all of the following items before using the product.

- Adapter board: 1
- Flat cables (standard: 8 cm): 2
- Flat cables (long: 20 cm): 2
- Operation manual (English version, this manual): 1
- Operation manual (Japanese version): 1

■ Optional parts

The optional parts for this product are shown in Table 1.

Table 1 Optional parts

Name	Part number
Evaluation MCU*1	FUJITSU MICROELECTRONICS FR family microcontroller (FR60 Lite)
DSU-FR emulator*2	MB2198-01-E
DSU-FR emulator header*3	MB2198-xxx-E
Oscillator*4, Capacitor*4	–

*1 : The package code of the evaluation MCU is BGA-420P-M01.
Contact the sales or support representative for details on the evaluation MCU model numbers and package codes that can be used with this adapter.

*2 : Debugger software and communications cables need to be purchased in order to use the emulator. Contact the sales or support representative if you are unsure of the details.

*3 : The header is an interface board used to connect the user system to the emulator. Select and purchase the suitable header for the mass production MCU to be used. Contact the sales or support representative for details on the suitable header for the mass production MCU to be used. See the header operation manual for handling and using headers and precautions of safe use.

*4 : See the data sheet of evaluation MCU for details on the frequency of the oscillator to use. Furthermore, see the data sheet of the oscillator for details on the values of the capacitors to connect to the oscillator.

2. PRODUCT DESCRIPTION

■ System configuration

The adapter is used in combination with the header, and is used to connect the emulator to a user system.
Figure 1 shows the system configuration for the adapter.

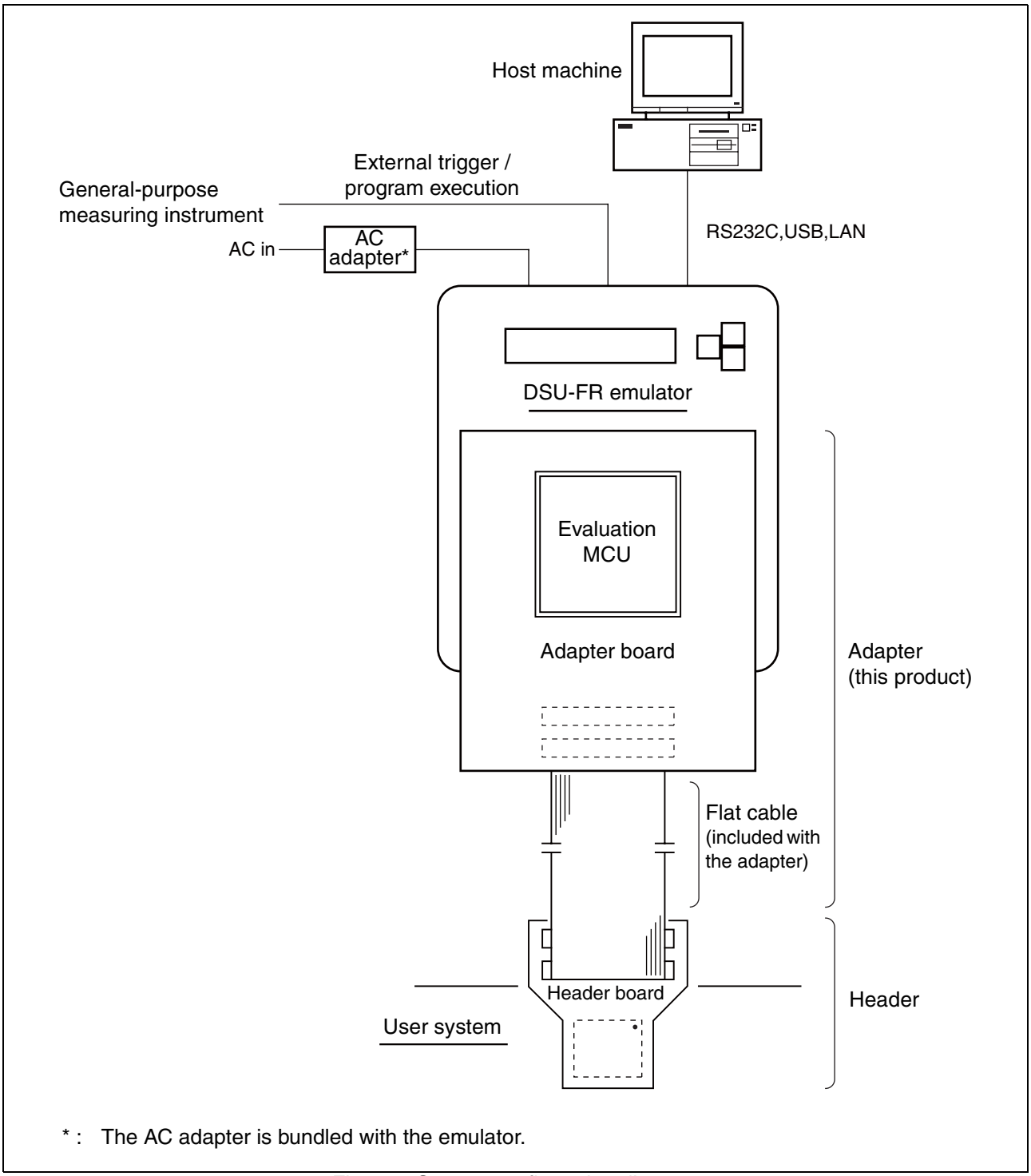


Figure 1 System configuration diagram

See the operation manual of the emulator for details on connecting the emulator to the host machine and general-purpose measuring instrument.
In order to use the emulator, a host machine and emulator debugging software need to be purchased separately. See the operation manual of the emulator for the emulator specifications.

■ Appearance and part names

Figure 2 gives an external view of the adapter board to identify each part of it.
The adapter board illustrated in Figure 2 is in the factory default states.

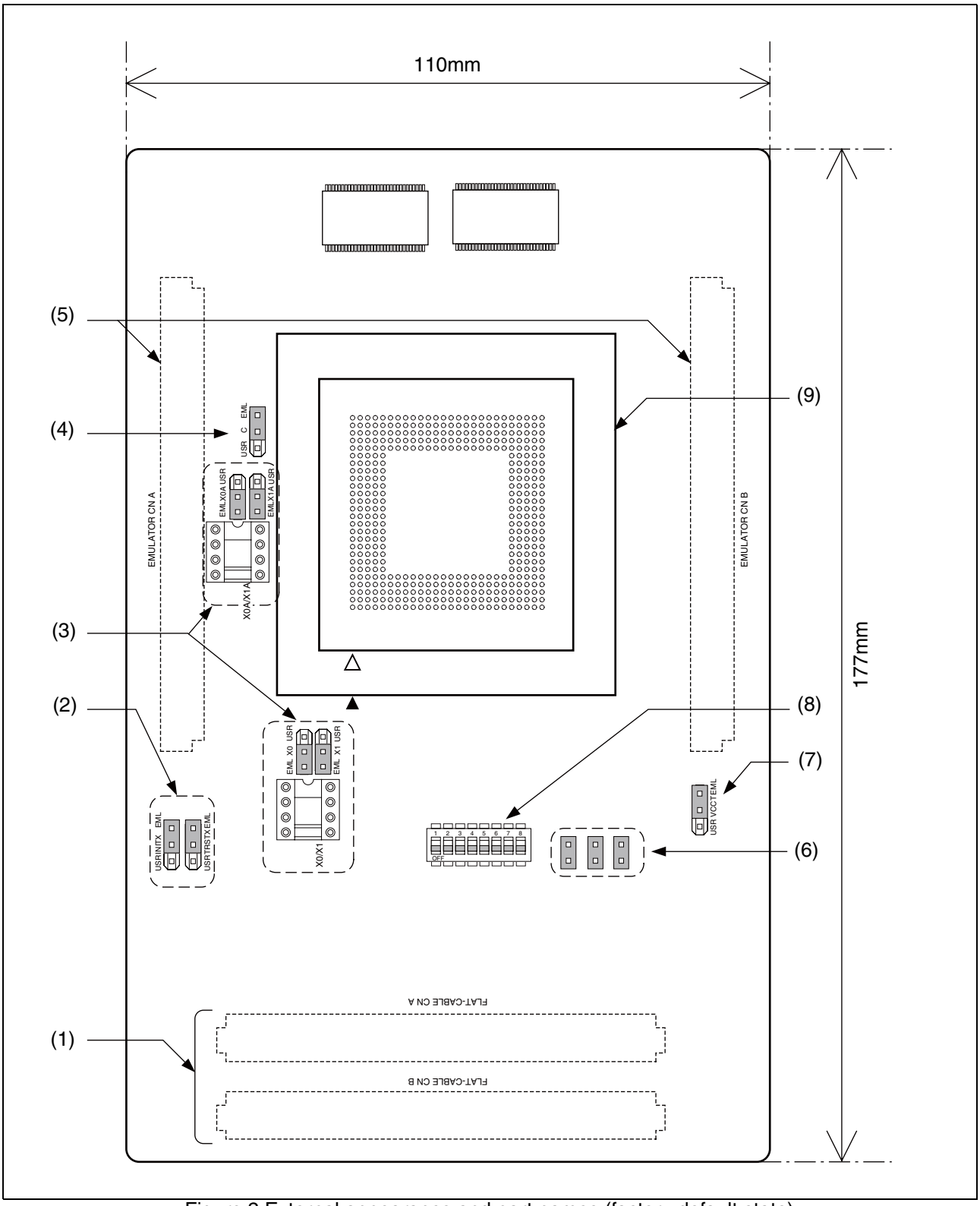


Figure 2 External appearance and part names (factory default state)

(1) Flat cable connectors
Use the flat cable packaged in this product, and connect to the header or user system (mounted on the rear side).

(2) Reset signal setting jumper plugs
These jumper plugs are used to set the reset signal supply source.

(3) Clock input IC sockets and clock input select jumper plugs
The IC sockets accept an oscillator and a capacitor for the main clock and sub clock, The jumper plugs are used to set the clock supply source.

(4) Jumper plugs for configuring the C pin
Jumper plugs that configure whether the C pin on the evaluation MCU is connected to the C pin on the user system or the capacitor on the adapter board.

(5) Emulator connector
Connector to be connected to the emulator (mounted on the rear side).

(6) Extension jumper plugs
Jumper plugs used for extended functions. These should normally all be shorted during use.

(7) Jumper plugs for setting the evaluation MCU power supply
Jumper plugs that configure whether the user system or the emulator is used as the supply source for the evaluation MCU tool power supply (VCCT).

(8) Bypass capacitor connection switch
A switch for connecting or disconnecting a bypass capacitor between DVCC and DVSS.

(9) IC socket for evaluation MCU
Evaluation MCU mounting IC socket for BGA-420 pin.

■ General specifications

Table 2 lists the general specifications of the adapter.

Table 2 General specifications

Item	Specification
Name	DSU-FR emulator BGA-420P adapter type 3
Part number	MB2198-150-E
Power supplies	Evaluation MCU: Internal power supply*: +1.8V (Generated from UVcc)
	Evaluation MCU: I/O power supply*: +3.5V to +5.5V (UVcc)
	Adapter board power supply: +3.3V (Supplied from emulator)
Internal operating frequency of MCU	Max: 48MHz
Operating temperature	+5 °C to +35 °C
Storage temperature	0 °C to +70 °C
Operating humidity	20% to 80% (No condensation)
Storage humidity	20% to 80% (No condensation)
External dimensions	177mm (W) × 110mm (D) × 34mm (H) (Including the IC socket and connector dimensions)
Weight	168g (Adapter board unit)

* : For details on the internal power supply and I/O power supply of each evaluation MCU, see the power supply specifications of the evaluation MCU. For details on each of the power supplies, see the “Evaluation MCU hardware manual” or contact the sales or support representative if you are unsure of the details.

■ Function specifications

Table 3 lists the major function specifications of the adapter.

Table 3 Adapter function specifications

Item	Description
Adapter function	Used in combination with the header board, it functions as the adapter for connecting the emulator to the evaluation MCU and user system. The connection to the emulator is a stack of connections that uses the emulator connectors on the adapter board.
External trace	The trace data is stored via the adapter in external trace memory (64 Ksteps (1 step: 69 bits)) that is built into the emulator itself.
Internal ROM emulation memory	2 MB of SRAM (512 Kword × 8 bit product × 4) is used as built-in ROM emulation memory.
Power supply selection	• Evaluation MCU tool power supply selection If the user system is used with a standalone adapter, the tool power for the evaluation MCU needs to be supplied from the user system. The evaluation MCU tool power supply source is therefore selected by jumper plugs on the adapter. Note: The user system power supply can only be selected as the evaluation MCU tool power supply source when the user system power supply is within the rated range of the evaluation MCU tool power supply (3.3V ± 0.3V). • C pin selection Jumper plugs on the adapter board select whether the C pin on the evaluation MCU is connected to the mass production MCU C pin or the capacitor (1µF) on the adapter board.
Clock supply selection	The adapter has IC sockets for mounting crystal oscillators that allow the CLK signals to the evaluation MCU to be supplied from the adapter board (the CLK is not supplied to the user system). The CLK signal from the user system and the CLK signal from the adapter are selected using jumper plugs. Use the X0, X1, X0A, and X1A jumper plugs to select the CLK signal.
Reset signal selection	If the user system is used with a standalone adapter, the reset signal needs to be supplied to the $\overline{\text{INIT}}$ and TRSTX pins from the user system. Jumper plugs on the adapter board select the connection destination of the reset signal.
Bypass capacitor between AVCC/ AVRH and AVSS	There are bypass capacitors (0.1µF) between both AVCC and AVSS, and AVRH and AVSS (AVRL) on the adapter board.
Connecting / disconnecting the bypass capacitor between DVCC and DVSS	There are bypass capacitors between DVCC and DVSS on the adapter board (10µF × 4), and these can be connected and disconnected by a switch.
Power-on debugging	Supports the power-on debug function* which runs a program immediately after the power-on sequence of the evaluation MCU.
Extension jumper plugs	When a header that supports the PGA-401P adapter type 2 (MB2198-130-E) is connected to this product, some of the I/O pins on this product are allocated to power supply pins on the header board. This jumper plugs are for connecting/disconnecting these signal lines as required.

* : This function requires that the evaluation MCU supports the power-on debugging function. Before using the function, see the “Evaluation MCU hardware manual” or contact the sales or support representative if you are unsure of the details.

■ Connector and socket specifications

Table 4 shows the specifications of the connectors and IC sockets mounted on the adapter board.

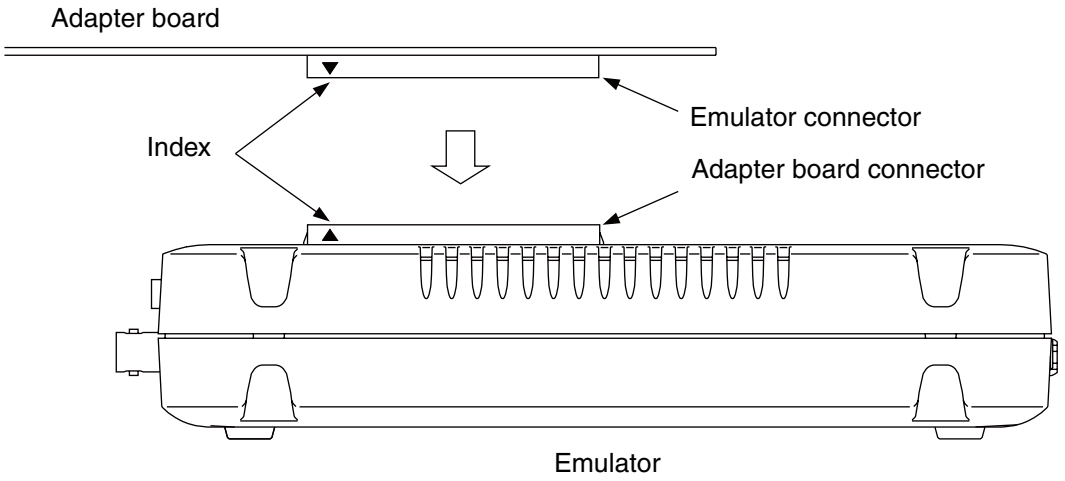
Table 4 Connector and IC socket specifications

Item	Description
Emulator connector	Use this connector to connect the emulator to the adapter. See the "■ Connecting the adapter board to the emulator" section in "3. Connection" for details on connecting the adapter to the emulator.
Flat cable connector	Connect the adapter to the header and the user system using flat cables coming with the adapter. See the "■ Connecting the adapter board to the header board" section in "3. Connection" for details on connecting the flat cables.
Evaluation MCU mounting IC socket	Mount the evaluation MCU (BGA-420P package). See the "■ Mounting the evaluation MCU" section in "3. Connection" for details on mounting the evaluation MCU.
Oscillator IC sockets	Mount an oscillator and a capacitor authorized for the oscillator. See the "■ Installing the oscillator" section in "4.2 Setting the clock supply circuit" for details on how to mount the oscillator and the capacitor for the oscillator.

3. CONNECTION

■ Connecting the adapter board to the emulator

Connect the adapter board to the adapter board connector on the emulator (see Figure 3).



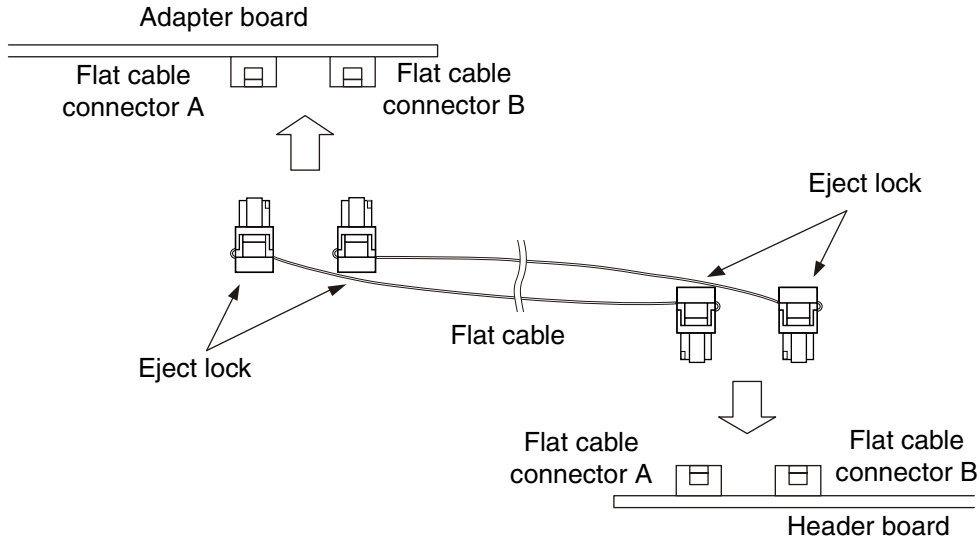
- Insert the connector for connecting the emulator to the adapter board securely to the far end, and align the index (▲) on each connector for prevention of incorrect insertion.
- Apply even force to the connector for removing the adapter board from the emulator.

Figure 3 Connecting the adapter board to the emulator

Note : Turn power off before board setting/removal.
Apply even force to the connector for unplugging the board.

■ Connecting the adapter board to the header board

Connect the adapter board to the header board using the flat cables that are provided with the adapter (see Figure 4).



- Insert the eject lock units into the flat cable connectors on each of the boards until locked.
- Disconnect the flat cables by pulling out the eject locks of the flat cables and releasing the locks.
- When the adapter board and the user system are connected directly with a flat cable, provide a specified connector on the user system conforming to Item 6 “User Interface Specifications”.

Figure 4 Connecting the adapter board with the header board

■ Mounting the evaluation MCU

Use the following procedure to mount the evaluation MCU in the IC socket for mounting the evaluation MCU on the adapter board (see Figure 5).

1. Push squarely down on the upper part of the IC socket.
2. Verify that the latch (for locking the evaluation MCU) is raised up.
   And align the index mark of evaluation MCU (●) and adapter board (▼), and place the evaluation MCU on the IC socket.
3. Gently lift up the upper part of the IC socket and verify that the evaluation MCU is locked by the latch for locking the evaluation MCU.

Note : When performing the procedure of pushing down on the upper part of the IC socket, make sure that the product is disconnected from the emulator, and support the reverse side of the circuit board from the emulator with your hands to prevent the circuit board from warping.

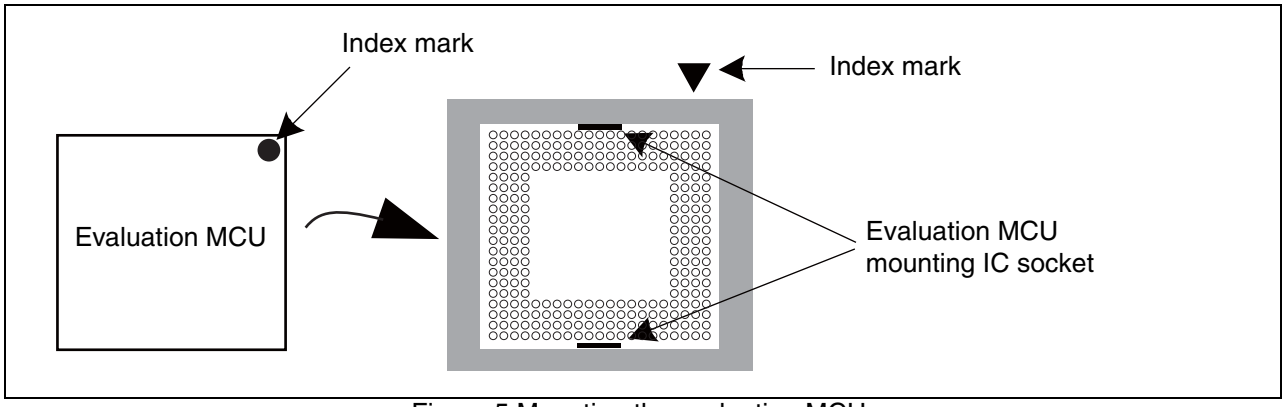


Figure 5 Mounting the evaluation MCU

4. OPERATING PROCEDURES

4.1 Configuring the Evaluation MCU C pin

■ Setting the jumper plugs for configuring the evaluation MCU C pin

The factory default setting of the jumper plugs for configuring the evaluation MCU C pin is shown in Figure 6 and the specifications of the jumper plugs for setting the evaluation MCU C pin setting is shown in Table 5.

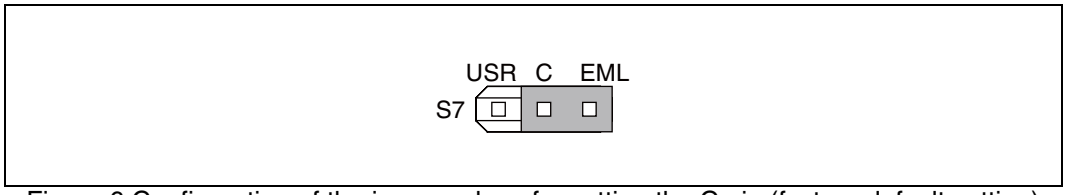


Figure 6 Configuration of the jumper plugs for setting the C pin (factory default setting)

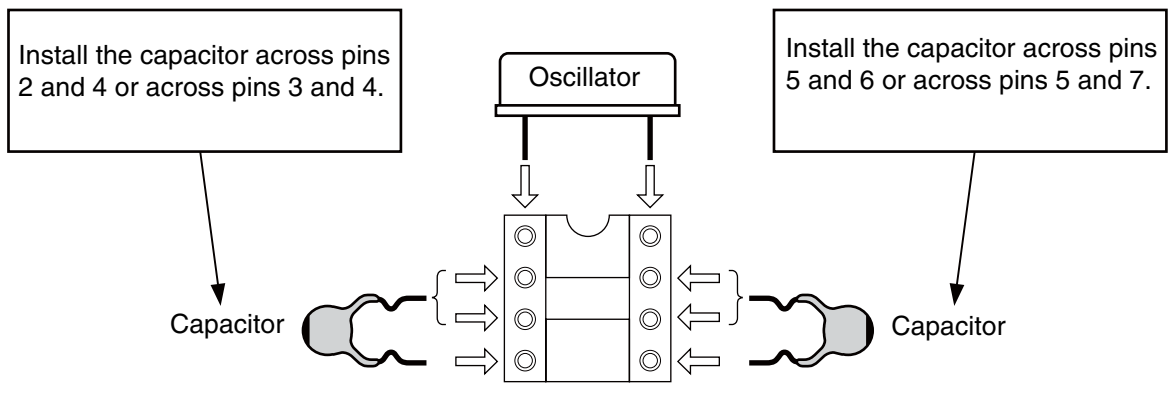
Table 5 Evaluation MCU C pin connection specifications

Jumper plug name	Setting	C pin connection settings
C	USR	Connects the C pin of the evaluation MCU to the capacitor on the user system
	EML	Applies the capacitor on the adapter board (1µF) to the evaluation MCU C pin

4.2 Setting the Clock Supply Circuit

■ Installing the oscillator

Mount the oscillators and capacitors on the oscillator IC sockets (SC2, SC3) of the adapter board to supply the clock signal from the adapter board to the main clock (X0/X1) and to sub clock (X0A/X1A) of the evaluation MCU respectively. The Figure 7 shows how to install the oscillator.


Install the capacitor across pins 2 and 4 or across pins 3 and 4.
Oscillator
Install the capacitor across pins 5 and 6 or across pins 5 and 7.
Capacitor
Capacitor

- See the data sheet of the the evaluation MCU for the oscillator frequency and other details.
- See the oscillator data sheet for details on the capacitor's capacitance.
- The oscillator and capacitors are not provided with this product and need to be purchased separately.

Figure 7 Installing the oscillator

Note : For a cpacitor that is mounted with the oscillator, use a capacitor about 10pF smaller than the recommended value of the oscillator.
When a capacitor of the recommended value of the oscillator is mounted, an oscillator stabilization time becomes longer than the standard time due to the parasitic capacitance of a socket and the influence of an interconnect load and that may cause a failure such as instability of clock switching operation etc.

■ **Setting the clock selection jumper plugs**

The factory settings of the jumper plugs are shown in Figure 8, and the correspondence between the clock selection jumper plugs and clock supply is shown in Table 6.

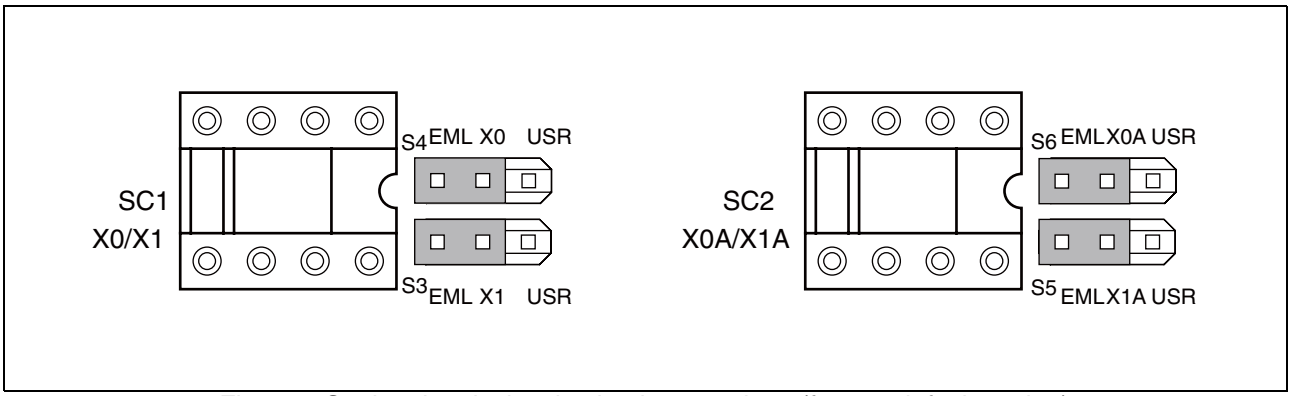


Figure 8 Setting the clock selection jumper plugs (factory default setting)

Table 6 Clock selection jumper plug settings and clock supply

Jumper plug name	Setting	Clock supply*
X0,X1	USR	Supply main clock signal from user system.
	EML	Supply main clock signal from oscillator IC socket on adapter.
X0A,X1A	EML	Supply subclock signal from oscillator IC socket on adapter (fixed on EML side).

* : There is no function to supply a clock signal from the adapter to the user system.

Note : To supply the main clock from the user system, create the oscillation circuit on the user system, buffer the main clock via the CMOS IC buffer or the like, and then supply it.
Since supplying the sub clock from the user system may result in instable operation, be sure to supply the sub clock from the adapter board.

4.3 Setting the Reset Signal

Supply the reset signals to the evaluation MCU by the user system or the emulator. Use the jumper plugs with the factory default settings.

■ **Setting the reset signal jumper plugs**

The factory default settings of the reset signal selection jumper plugs are shown in Figure 9.
Under the factory default settings, the INITX signal ($\overline{\text{INIT}}$) is supplied to the evaluation MCU from the INITX signal on the user system via the emulator, and the TRSTX signal is supplied to the evaluation MCU from the reset signal of the emulator.

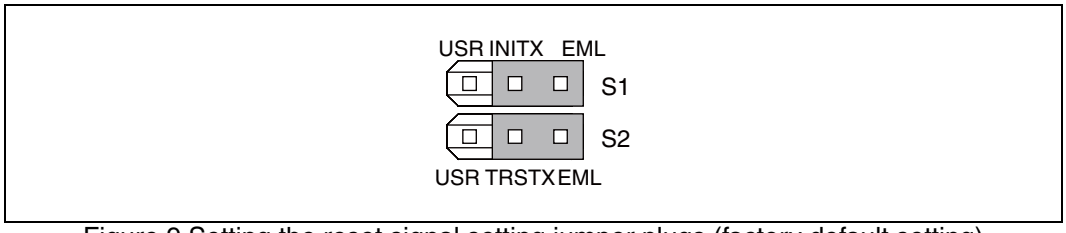


Figure 9 Setting the reset signal setting jumper plugs (factory default setting)

Table 7 Reset signal jumper plug settings

Jumper plug name	Setting	Reset signal connection
INITX	USR	The $\overline{\text{INIT}}$ pin from the user system is connected directly to the $\overline{\text{INIT}}$ pin on the evaluation MCU (for standalone adapter use)
	EML	The $\overline{\text{INIT}}$ pin from the user system is connected to the $\overline{\text{INIT}}$ pin on the evaluation MCU via the emulator Always use this setting when the emulator is being used.
TRSTX	USR	Connects the $\overline{\text{INIT}}$ pin from the user system to the TRSTX pin on the evaluation MCU (for standalone adapter use)
	EML	Connects the TRSTX pin from the evaluation MCU to the emulator Always use this setting when the emulator is being used

4.4 Selecting the Connection of the Bypass Capacitor for DVCC and DVSS

A bypass capacitor is able to be connected and disconnected as needed between the DVCC and DVSS pins for when the corresponding lines are used as the DVCC and DVSS power supply (currently only supported by the FR60 Lite).

■ Configuring the bypass capacitor for DVCC and DVSS

The factory default setting are shown in Figure 10. The corresponding pins are used as general-purpose ports under the factory default setting. Furthermore, when the pins are used as DVCC and DVSS, the capacitor can be connected between DVCC and DVSS by setting the switch to ON.
See Table 8 for details on the switch settings.

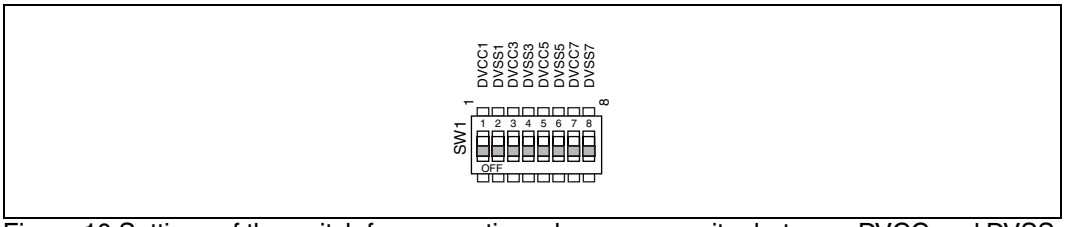


Figure 10 Settings of the switch for connecting a bypass capacitor between DVCC and DVSS (factory default setting)

Table 8 Settings of the switch for connecting a bypass capacitor between DVCC and DVSS

Element number (Labeled on switch)	Setting	Bypass capacitor connection
1, 2	ON	Connects a capacitor (10µF/25V) between P56 (DVCC1) and P60 (DVSS1)
	OFF	Always set to OFF when used as P56 and P60
3, 4	ON	Connects a capacitor (10µF/25V) between P72 (DVCC3) and P74 (DVSS3)
	OFF	Always set to OFF when used as P72 and P74
5, 6	ON	Connects a capacitor (10µF/25V) between P85 (DVCC5) and P87 (DVSS5)
	OFF	Always set to OFF when used as P85 and P87
7, 8	ON	Connects a capacitor (10µF/25V) between PA1 (DVCC7) and PA3 (DVSS7)
	OFF	Always set to OFF when used as PA1 and PA3

4.5 Configuring the Evaluation MCU Tool Power Supply

■ Configuring the jumper plugs for the evaluation MCU tool power supply settings

The factory default setting of the jumper plug for configuring the evaluation MCU tool power supply setting is shown in Figure 11 and the evaluation MCU tool power supply setting specification for the jumper plugs is shown in Table 9.

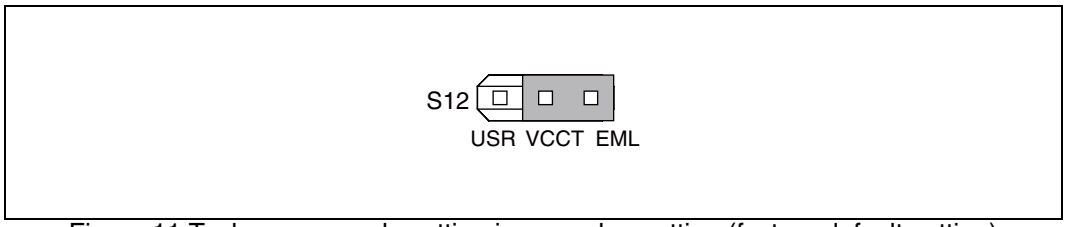


Figure 11 Tool power supply setting jumper plug setting (factory default setting)

Table 9 Evaluation MCU tool power supply specifications

Jumper plug name	Setting	Tool power supply
VCCT	USR*	The evaluation MCU tool power supply is supplied by the user system power supply (adapter used by itself).
	EML	Evaluation MCU tool power supply is supplied by the emulator. Always set this jumper to EML when using the emulator.

* : The power supply source for the evaluation MCU tool power supply can only be set to the user system power supply when the user system power supply voltage is within the evaluation MCU tool power supply ratings range (3.3V ± 0.3V).

4.6 Power-on/Shutdown Procedures

Turn the power on after completing all of the connections in the sequence: host machine → emulator → user system.
Turn the power off in the sequence: user system → emulator → host machine.

■ Power-on procedure

Turn the power on using the sequence shown in Figure 12 after completing all of the connections.
The emulator power is turned on by pressing the power switch on the back of the emulator. The power switch remains depressed when pressed.
See the operation manual of the emulator for details on the position of the power switch.

Note : When turning on the individual components of your system, follow the power-on procedure specified in this manual.
Once you have turned the adapter on, do not carry it or apply shock or vibration to it.

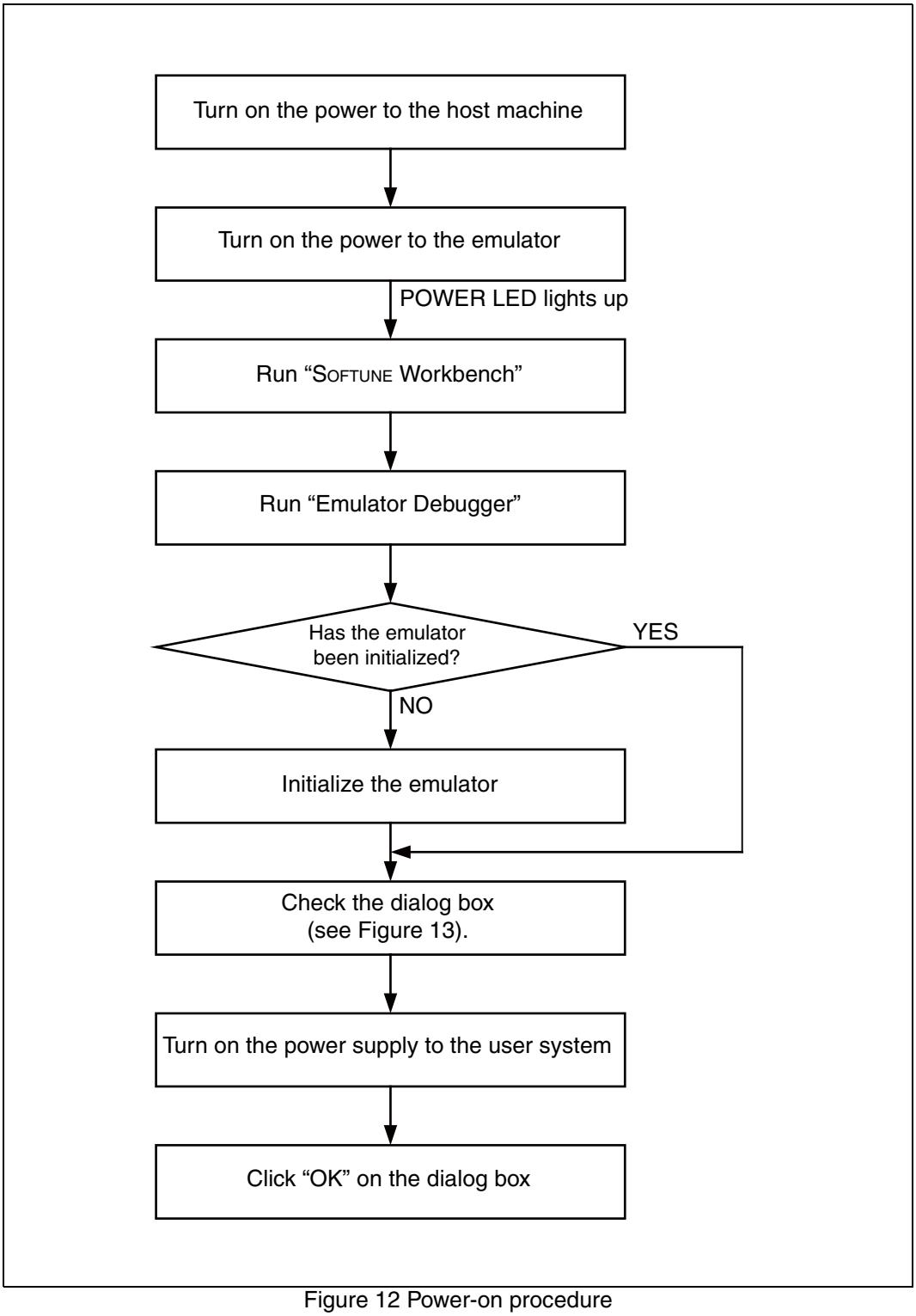

Turn on the power to the host machine
Turn on the power to the emulator
POWER LED lights up
Run “SOFTUNE Workbench”
Run “Emulator Debugger”
Has the emulator been initialized?
YES
NO
Initialize the emulator
Check the dialog box (see Figure 13).
Turn on the power supply to the user system
Click “OK” on the dialog box

Figure 12 Power-on procedure

Figure 13 Dialog display

■ Power-off procedure

Turn the power off using the sequence shown in Figure 14.
Turn off the power supply to the emulator by pressing the switch on the rear of the emulator and releasing your finger. The switch then returns to the off state with the switch protruding.
See the operation manual of the emulator for details on the position of the power switch.

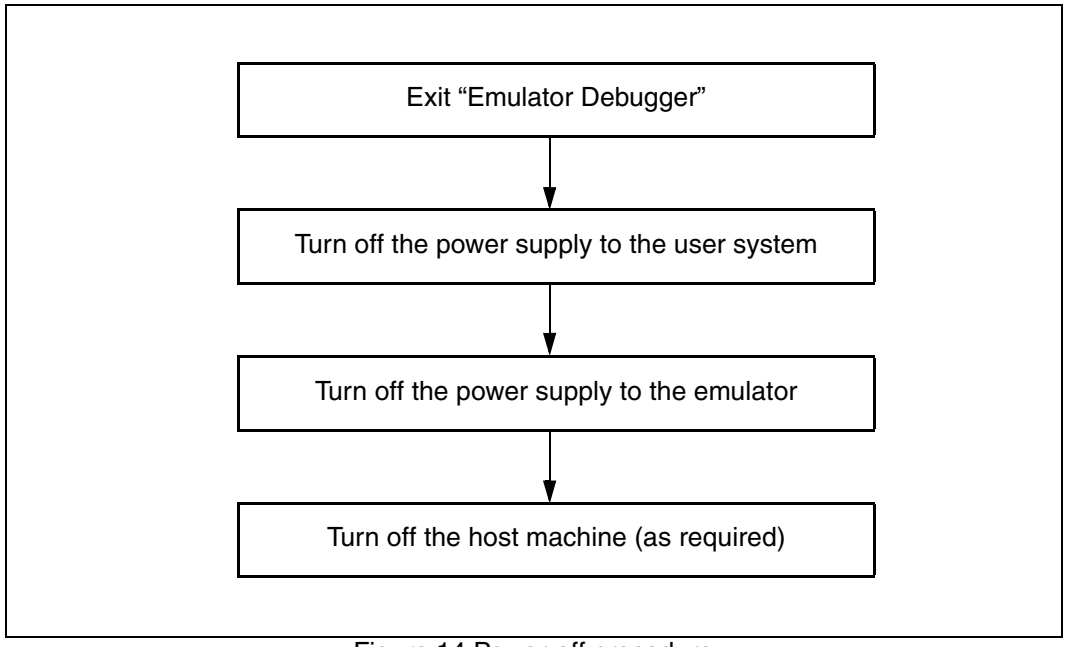

Exit “Emulator Debugger”
Turn off the power supply to the user system
Turn off the power supply to the emulator
Turn off the host machine (as required)

Figure 14 Power-off procedure

Note : When turning off the individual components of your system, follow the shutdown procedure specified in this manual.

5. CAUTIONS

■ General cautions on the adapter

- Disconnect all of the power supplies from the adapter, emulator, and user system before setting any jumper plugs or switches on the adapter board.
- When an oscillator is mounted on the user system and a clock signal is supplied to the evaluation MCU, the wiring pattern from the clock signal source on the user system side may be too long to provide oscillation.
- If it is instructed that the X0 or X1 pin should be opened as restricted to the evaluation MCU when a clock signal is being supplied from the user system to the evaluation MCU using an oscillator, remove the jumper plug for switching the clock signal supply source on the specified side. This is also applicable to X0A/X1A pin.
- When using the emulator, set the reset signal jumper plug which selects the control source of the $\overline{\text{INIT}}$ pin of the evaluation MCU to the EML side. When the emulator is being used, the emulator controls the $\overline{\text{INIT}}$ pin of the evaluation MCU, and the reset input from the user system is not connected directly to the evaluation MCU, but is routed via the emulator. The reset timing is therefore delayed by several clock cycles compared to the actual reset timing.
  Furthermore, when a reset is performed using the emulator reset command, only the evaluation MCU is reset, and the user system is not reset.
  In addition, the signal to the $\overline{\text{INIT}}$ pin from the user system is masked by the emulator during a break.
- The states of the user bus pins when the evaluation MCU is in user hold or low power consumption modes are the same as the states shown in the MCU hardware manual.
- The long type flat cable can be used if the MCU's clock frequency is low or the load of the user pin is very low. Basically, use the standard type flat cable.
- If using the adapter and the header, always make sure that the MCU on the user system is socket-mounted in order to be removed. Use the specified IC socket for the MCU socket.
- Power is not supplied from the adapter, header, or emulator to the user system.

■ Cautions when using the power-on debug function

- When performing power-on debugging, pay attention to the settings related to the power supply.
- The following three conditions must be satisfied when the power supply is turned off by power-on debugging:
  - It takes 25 µs or more for all the power supply levels of the evaluation MCU to decrease from 0.9 Vcc to 0.5 Vcc.
  - The CPU operating frequency is 1 MHz or higher.
  - A user program is being executed.
- For details on the power-on debug function, see the emulator operation manual.

6. USER INTERFACE SPECIFICATIONS

■ User interface specifications

The correspondence between the pin numbers of flat cable connectors A and B on the adapter board and those on the header or user system are shown in Figure 15, and the correspondence between the pin numbers of flat cable connectors A and B and the evaluation MCU is shown in Table 10 and Table 11.

Note that the evaluation MCU signal names in the table are provisional names and the actual signal names vary with each model. The actual evaluation MCU signal names can be judged from the evaluation MCU pin numbers. If you are unsure of the details, contact a sales or support representative. The following notation and warnings apply to each of the evaluation MCU signal names.

" - " : Unconnected (open) pin.

: UVCC

The power supply (VDD) pins of the evaluation MCU are as follows:
VDD = E4, G5, K5, M5, AA3, AF2, AB7, AB10, AF9, E15, E12, E9, E6, A2

: GND

The ground (VSS) pins of the evaluation MCU are as follows:
VSS = D1, H5, L5, L1, T5, W1, W5, AB1, AB5, AF1, AC4, AB8, AB11, AF11, AF14, AB16, AF19, AB19, AB22, AF26, AB26, W22, T22, T26, N26, L22, H22, F24, E22, A26, A22, E19, D18, E16, A16, E14, C14, E11, E8, E5, A1

: DVCC

The high current output buffer pin power supply (DVCC) pins of the evaluation MCU are as follows:
DVCC = K2, L4, N2, N3, R3, U1, V4, Y2

: DVSS

The high current output buffer pin ground (DVSS) pins of the evaluation MCU are as follows:
DVSS = K1, L3, P1, P5, U2, T4, V3, AA1

Note : The pins that are identified by the underlined evaluation MCU signal names in the table may have additional circuitry attached for controlling the evaluation MCU. As a result, the electrical characteristics of these pins may differ from an actual MCU.

See the sections listed below for details on the additional circuit for each signal.

- X0/X1: See Section 4.2 "Setting the Clock Supply Circuit"
- X0A/X1A: See Section 4.2 "Setting the Clock Supply Circuit"
- $\overline{\text{INIT}}$: See Section 4.3 "Setting a Reset Signal"

It is recommended to use the standard type flat cable bundled with the adapter board to prevent noise trouble.

Provide a connector equivalent to the flat cable connector on the user system to connect the adapter board and the user system directly with the flat cable. The part number of the flat cable connector is as follows: Flat cable connector part number: 8930E-100-178MS-F (manufactured by KEL)

Note that the pinouts of flat cable connectors A and B are different between the adapter board and the user system.

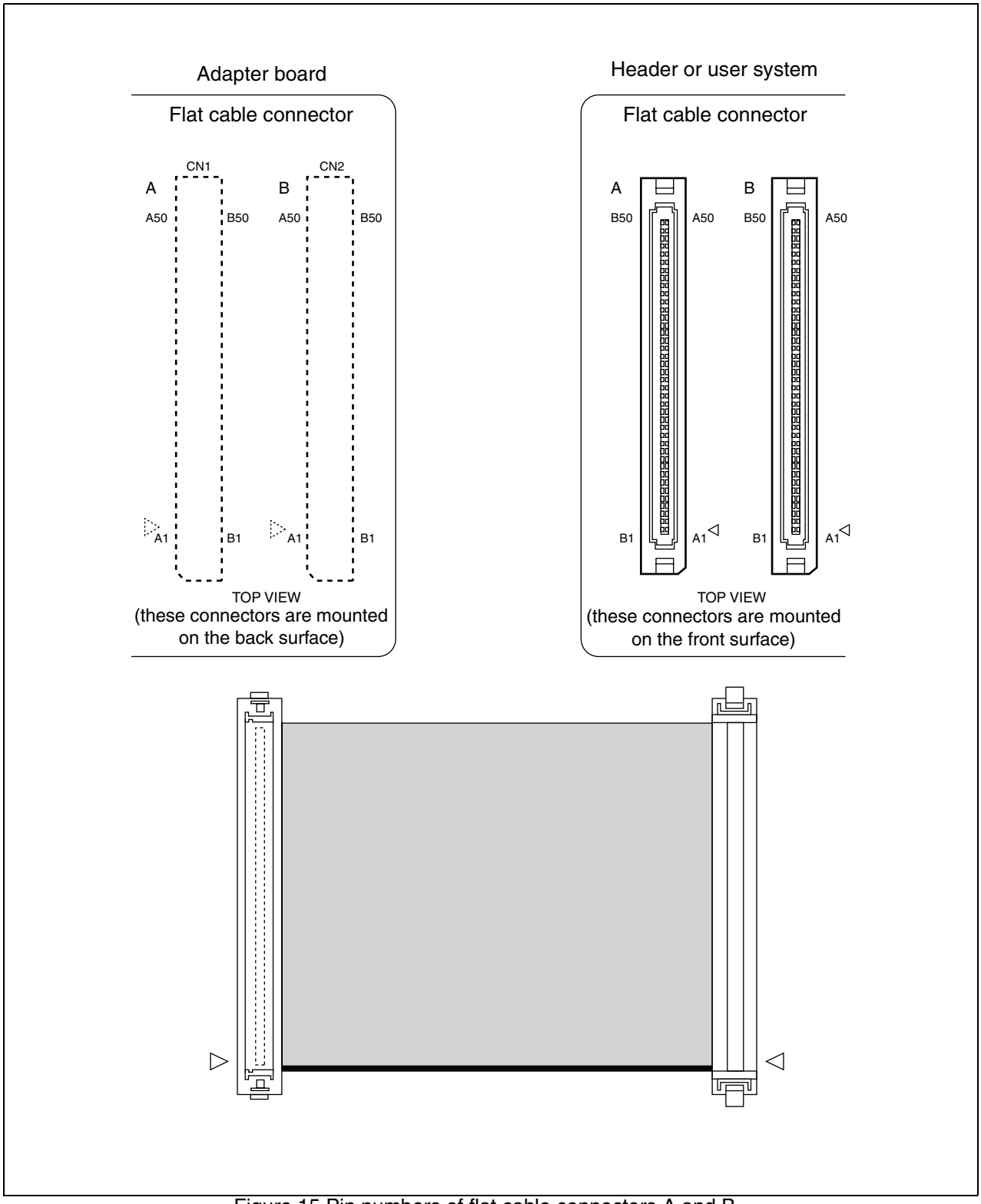


Figure 15 Pin numbers of flat cable connectors A and B

Table 10 Pinouts of flat cable connector A

Connector pin number	Evaluation MCU pin number	Evaluation MCU signal name (provisional name)	Connector pin number	Evaluation MCU pin number	Evaluation MCU signal name (provisional name)
A1	VSS	VSS	B1	VSS	VSS
A2	T3	PA0	B2	V2	PA1
A3	U5	PA2	B3	U4	PA3
A4	W2	PA4	B4	U3	PA5
A5	Y1	PA6	B5	Y4	AVCC
A6	Y5	AVRH	B6	-	-
A7	AA5	AVSS	B7	AC3	PC5
A8	AE1	PC6	B8	AD2	PC7
A9	AE3	NC (PC3)	B9	AF3	NC (PC4)
A10	AD4	NC (PC5)	B10	AD5	NC (PC6)
A11	AD3	NC (PC7)	B11	VSS	VSS
A12	W3	PA7	B12	V4	DVCC07
A13	D15	C2	B13	Y2	DVCC08
A14	U2	DVSS05	B14	T4	DVSS06
A15	VSS	VSS	B15	U1	DVCC06
A16	T2	P97	B16	R3	DVCC05
A17	T1	P95	B17	R4	P96
A18	R2	P93	B18	R5	P94
A19	P3	P92	B19	VSS	VSS
A20	P2	P90	B20	R1	P91
A21	N3	DVCC04	B21	P1	DVSS03
A22	N4	P87	B22	N2	DVCC03
A23	VSS	VSS	B23	AF8	PF4
A24	B10	PB7	B24	N1	P86
A25	B14	X0A	B25	A14	X1A
A26	M1	P84	B26	N5	P85
A27	M3	P83	B27	VSS	VSS
A28	M4	P81	B28	M2	P82
A29	L3	DVSS02	B29	L2	P80
A30	L4	DVCC02	B30	K1	DVSS01
A31	VSS	VSS	B31	K2	DVCC01
A32	K3	P57	B32	J1	P54
A33	K4	P55	B33	J2	P56
A34	H1	P51	B34	AC10	WAKE
A35	H2	P50	B35	VSS	VSS
A36	H3	P46	B36	J3	P47
A37	AD10	PF3	B37	C2	P20
A38	B1	P21	B38	C1	P22
A39	VSS	VSS	B39	D3	P23
A40	E3	P24	B40	C3	P25
A41	D2	P26	B41	D4	P27
A42	E2	P30	B42	F5	P31
A43	F3	P32	B43	VSS	VSS
A44	F4	P33	B44	E1	P34
A45	G4	P35	B45	F2	P36
A46	F1	P37	B46	G3	P40
A47	H4	P41	B47	AE9	P67
A48	J5	P43	B48	G2	P42
A49	J4	P45	B49	G1	P44
A50	VSS	VSS	B50	VSS	VSS

Table 11 Pinouts of flat cable connector B

Connector pin number	Evaluation MCU pin number	Evaluation MCU signal name (provisional name)	Connector pin number	Evaluation MCU pin number	Evaluation MCU signal name (provisional name)
A1	VSS	VSS	B1	VSS	VSS
A2	-	-	B2	C12	PB5
A3	B11	PB4	B3	D12	PB3
A4	A11	PB2	B4	B12	PB1
A5	C13	PB0	B5	AE8	NC (PF3)
A6	AD9	PF2	B6	AD8	PF1
A7	VSS	VSS	B7	AC9	PF0
A8	AF7	NC (PE7)	B8	AB9	P66
A9	AE7	P65	B9	AC8	P64
A10	AD7	P63	B10	AF6	P62
A11	AE6	P61	B11	VSS	VSS
A12	AC7	P60	B12	AF5	P77
A13	AC6	P76	B13	AD6	P75
A14	AB6	P74	B14	AE5	P73
A15	VSS	VSS	B15	A10	PB6
A16	AC5	P72	B16	AF4	P71
A17	VDD	VDD	B17	AE4	P70
A18	AC2	PC4	B18	AB3	PC3
A19	AE2	PC2	B19	VSS	VSS
A20	AD1	PC1	B20	AA4	PC0
A21	AC1	NC (PB2)	B21	AB4	NC (PB1)
A22	AB2	NC (PB0)	B22	A12	NC (MD3)
A23	VSS	VSS	B23	AA2	NC (PA7)
A24	W4	NC (PA6)	B24	Y3	NC (PA5)
A25	AA1	DVSS08	B25	V3	DVSS07
A26	VDD	VDD	B26	B15	X0
A27	A15	X1	B27	VSS	VSS
A28	B3	P17	B28	C4	P16
A29	B4	P15	B29	C5	P14
A30	B2	P13	B30	A3	P12
A31	VSS	VSS	B31	D6	P11
A32	A4	P10	B32	D5	P07
A33	B5	P06	B33	C6	P05
A34	E7	P04	B34	A5	P03
A35	D7	P02	B35	VSS	VSS
A36	VDD	VDD	B36	B6	P01
A37	D8	P00	B37	A13	$\overline{\text{INIT}}$
A38	E13	MD0	B38	B13	MD1
A39	VSS	VSS	B39	D13	MD2
A40	C7	NC (PI7)	B40	A6	V3
A41	C9	P53	B41	B7	P52
A42	D9	V0	B42	C8	NC (PI2)
A43	A7	NC (PI1)	B43	VSS	VSS
A44	C10	NC (PI0)	B44	B8	PE7
A45	D10	PE6	B45	A8	PE5
A46	E10	PE4	B46	B9	PE3
A47	VSS	VSS	B47	C11	PE2
A48	A9	PE1	B48	VDD	VDD
A49	D11	PE0	B49	-	-
A50	VSS	VSS	B50	VSS	VSS

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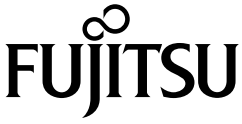
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